

April 9, 2003

LICENSEE: Omaha Public Power District

FACILITY: Fort Calhoun Station, Unit 1

SUBJECT: REPORT FROM STAFF'S LICENSE RENEWAL AUDIT CONDUCTED AT FORT CALHOUN STATION, UNIT 1 (FCS) FROM JANUARY 6 THROUGH 10, 2003, AND FROM JANUARY 20 THROUGH 23, 2003

The NRC staff performed an aging management review (AMR) inspection at FCS from January 6-10 and January 20-23, 2003. The purpose of the inspection was to examine activities that support the application of a renewed license at FCS. Concurrent with this inspection, the staff performed a separate audit of specific issues raised by staff reviewers. The audit team consisted of project managers from NRC headquarters. The audit report is provided below.

1. Generic Aging Lessons Learned Evaluation Approach

The audit team requested information on how the applicant ensured that the on-site implementation procedures would be consistent with the Generic Aging Lessons Learned Report. In response, the applicant provided a "program engineering analysis evaluation guideline," which provided guidance to personnel responsible for developing the aging management programs and the associated implementing procedures. The use of the guideline ensured a standard approach to evaluating on-site procedures against the Generic Aging Lessons Learned aging management programs. The team confirmed that the approach provided in the guideline was used throughout the program engineering analysis's.

2. Commitment Tracking

During the course of the staff's review of the License Renewal Application (LRA) and confirmatory inspections, a number of issues were identified that are not yet developed. For these circumstances, the applicant has committed to providing information or resolutions to issues at a future date. During the AMR audit, the team investigated how the applicant will track these commitments to ensure that they are identified, tracked, and resolved. In response to the team's request, the applicant provided procedures NOD-QP-23, "Commitment Action Tracking System," and NOD-QP-34, "Ongoing Commitment Program."

The purpose of the Commitment Action Tracking System is to provide a system to facilitate the orderly handling of regulatory commitments. The procedure also allows for processing of internally-identified action items associated with correspondence or management requests. The procedure establishes a defined methodology for the assignment, tracking, and closure of commitments, thereby assuring that applicable obligations are met.

Ongoing commitments are managed through the ongoing commitment program. The applicant defines ongoing commitments as those regulatory commitments for which continued compliance is required or implied. Ongoing commitments are part of the current licensing basis and as such, the applicant is obligated to comply with the commitments until they are deleted or revised.

The primary method of administratively controlling ongoing commitments is to annotate implementing documents. The commitments are classified as "ongoing" in an electronic database for a backup method to control the commitments and to provide a mechanism for performing searches.

3. Scoping, Screening, and Aging Management of SSCs Which Meet the 10 CFR 54.4(a)(2) Criterion

With regard to the applicant's response to request for additional information (RAI) 2.1-1, the team requested the applicant to provide revisions to the LRA Section 2 and Section 3 tables to identify structures and components within the scope of license renewal, and subject to an AMR as a result of meeting the 54.4(a)(2) criterion. In response to the teams request, the applicant explained its methodology for identifying SSCs which meet the 54.4(a)(2) criterion and how components meeting the criterion are managed. Specifically, the applicant clarified that it used a "spaces" approach for managing these structures and components. Specifically, the general corrosion of external surfaces program and the structures monitoring program perform walkdowns in the spaces where the seismic II/I interactions are possible. Any evidence of degradation is identified, reported in a condition report, and dealt with through the corrective action program. Additionally, where applicable for seismic II/I systems, the chemistry program and the flow-accelerated corrosion program have also been credited. The chemistry program is a system-based mitigative program that prevents loss of material in those systems where chemistry is maintained and readily lends itself to the spaces approach of managing applicable seismic II/I systems. Using walkdowns, any evidence of degradation of these systems would be identified and documented.

The flow accelerated corrosion program performs an additional inspection function for loss of material in those high-energy systems included in the program. It is a component-based program that looks at the most susceptible locations for flow accelerated corrosion and provides a bounding approach for the remainder of the system. For this reason, it does not lend itself readily to the spaces approach. Auxiliary steam and condensate return have been added to the scope of license renewal for seismic II/I considerations. These systems are included in the flow accelerated corrosion program along with main steam, feedwater, and steam generator blowdown, which were already in scope and managed for flow accelerated corrosion. Through the use of the spaces approach and the flow accelerated corrosion program, the applicant states that they will manage aging of components that have been added to the license renewal scope to satisfy 10 CFR 54.4(a)(2). Therefore, there are no revisions to Section 2 or Section 3 tables required.

The team obtained copies of Engineering Analysis (EA)-FC-00-149 to provide to the LRA reviewers for further review and evaluation.

4. Functional Realignment

EA-FC-00-127, "Miscellaneous Systems, Penetrations and Components," states that the compressed air, demineralized water, and steam generator feedwater blowdown systems contained components that were functionally realigned. The team noted that this was inconsistent with LRA Table 2.2-1 and LRA Section 2.3.2.2. LRA Table 2.2-1 states that containment isolation and/or pressure boundary components in the compressed air, demineralized water, and blowpipe systems were functionally realigned to the commodity group

"Containment Penetration and System Interface Components for Non-CQE Related System." However, LRA Section 2.3.2.2, which describes this commodity group, states that the group contains containment isolation valves from the feedwater blowdown, compressed air, blowpipe, and demineralized water systems, as well as the piping between the containment penetrations and the containment isolation valves. It also states that the demineralized water heat exchangers are included in the commodity group to maintain the component cooling water system pressure boundary. LRA Table 2.2-1 and the description in LRA Section 2.3.2.2 are inconsistent in that the blowdown system is not identified in LRA Table 2.2-1 as having components that were functionally realigned. The discrepancies between LRA Table 2.2-1 and the description in LRA Section 2.3.2.2 will be resolved in the staff's safety evaluation report.

5. Engineered Safety Features (ESF) Systems

a. Bolting in Engineered Safety Features Systems

The AMR audit attempted to confirm the material used in bolting in the ESF systems. The team reviewed EA-FC-00-139, "Bolting Integrity Program," to identify the bolting in the safety injection and containment spray system and the containment penetration, and system interface components for non-CQE (CPENME) system, respectively. The team confirmed that bolting in the safety injection and containment spray system is made of carbon, stainless, or low-alloy steel, while bolting in the CPENME system is made of carbon and low-alloy steel.

The team also attempted to confirm the materials and environments for the safety injection and containment spray heat exchangers, as identified in AMR link 3.2.1.09. The team reviewed EA-FC-00-126, "(SI) LPSI/HPSI/CS," and confirmed that the heat exchanger materials and environments associated with AMR link 3.2.1.09 were stainless steel, carbon steel, and cast iron exposed to corrosion-inhibited treated water.

Finally, the team attempted to confirm that no heat exchangers in the ESF systems are serviced by raw water. During the AMR audit, the applicant explained that there are no ESF heat exchangers that are normally serviced by raw water. There are several heat exchangers (shutdown cooling heat exchangers, high and low pressure safety injection pump bearing oil and seal coolers, and the containment spray pump bearing oil and seal coolers) for which raw water would be used if component cooling water (CCW) is not available in an emergency. The applicant stated that raw water is used as a backup to CCW, but is not credited.

b. The audit team requested the applicant to confirm the following information in the LRA:

- i material for bolting in the safety injection and containment spray system as well as the containment penetration and system interface components for non-critical quality equipment systems;
- ii that no heat exchangers in the ESF systems are serviced by raw water;
- iii that safety injection and containment spray heat exchanger material and environments are consistent with LRA AMR item 3.2.1.09.

In response, the applicant confirmed:

- i that the safety injection and containment spray systems have carbon, stainless, and low-alloy steel bolting, and that the containment penetration and system interface components for non-critical quality equipment systems have carbon steel and low-alloy steel bolting;
- ii that no ESF heat exchangers are normally serviced by raw water. However, raw water could be used to cool the ESF heat exchangers in an emergency;
- iii that the safety injection and containment spray heat exchanger components that are managed by 3.2.1.09 are stainless and carbon steel, and cast iron in a treated water environment.

6. Auxiliary Systems

a. Elastomer components in ventilation systems

In response to RAI 3.3.1-1, the applicant stated that the aging effects of hardening and loss of strength for elastomers will be managed by the periodic surveillance and preventive maintenance program. The aging management task will include performance of “hands on” inspections of elastomer expansion joints, seals, and vibration isolators for hardening and loss of strength. The RAI response states that these tasks will be performed at least once per refueling cycle (approximately 18 months). Finally, the periodic surveillance and preventive management program will be added to 3.3.1.02. During the AMR audit, the audit team attempted to confirm that these revisions have been made.

The audit team found that the revisions are being made to link 3.3.1.02 of LRA Table 3.3-1. The applicant has developed Action Request 29894/27 to track the implementation of this commitment.

b. Instrument Air

The staff noted that LRA Table 2.3.3.8-1 identifies AMR link 3.3.1.07 for the accumulators. The staff believed that this link should be 3.3.1.05, and asked the audit team to confirm this. During the AMR audit, the team discussed this issue with the applicant, who confirmed that the correct link should be 3.3.1.05, and has been corrected in the associated Engineering Analyses. However, the team did not see corrections to LRA Table 2.3.3.8-1, or an action request to revise the LRA table.

c. Heat Exchanger Tubes

The audit team attempted to confirm that the heat exchanger tubes were included in the heat exchangers listed in LRA Table 2.3.3.10-1 (Containment Heating, Ventilation and Air Cooling) and 2.3.3.12-1 (Control Room Heating, Ventilation and Air Cooling, and Toxic Gas Monitoring).

The team reviewed Attachment 9.13 of EA-FC-00-090, "Containment Ventilation," and EA-FC-00-125, "Control Room HVAC & Toxic Gas Monitoring," which identifies components in the containment and control room HVAC systems. These attachments confirmed that the heat exchanger tubes were included in the applicant's evaluation of the heat exchangers.

The audit team also attempted to confirm whether auxiliary building HVAC heat exchangers are subject to an AMR. The team reviewed EA-FC-00-096, "Auxiliary building Ventilation System," and confirmed that there are no heat exchangers subject to an AMR in the auxiliary building HVAC systems.

- d. The audit team requested the applicant to confirm the following information in the LRA:
 - i the issues provided in response to RAI 3.3.1-1;
 - ii whether link 3.3.1.07 for accumulators in License Renewal Application Table 2.3.3.8-1 is correct, or whether the link should be 3.3.1.05.

In response, the applicant confirmed:

- i that the information provided in response to RAI 3.3.1-1 was correct;
 - ii that link 3.3.1.07 was incorrect and should be 3.3.1.05. The applicant will revise the engineering analysis.
- e. Containment Ventilation, Auxiliary Building HVAC, Control Room HVAC and Toxic Gas Monitoring
- f. Raw Water

The team asked if aging management of the heat exchanger tubes is included in the management of the heat exchangers for the containment ventilation and control room HVAC and toxic gas monitoring systems, and whether the auxiliary building HVAC system has heat exchangers and tubes that are subject to an AMR. In response, the applicant stated that the heat exchanger tubes in the containment ventilation and control room HVAC and toxic gas monitoring systems are managed by the cooling water corrosion program, and that there are no heat exchangers in the auxiliary building HVAC system.

The raw water system empties into the circulating water discharge. The team requested the applicant to discuss the likelihood of a failure of the circulating water discharge tunnel and its impact on the raw water function. The applicant stated that a failure of the circulating water discharge tunnel would not prevent the raw water system from performing its function.

In addition, LRA Table 2.3.3.15-1 refers to LRA Table 3.3-1, item 16, for several components. LRA Table 3.3-1, item 16 covers the loss of material of stainless steel, carbon steel, cast iron, and bronze in raw water, as discussed in GALL. The staff noted that for many of the GALL components that utilize Table 3.3-1, item 16, the GALL

Report also identifies selective leaching of materials as an applicable aging effect. The selective leaching of these components should be addressed via LRA Table 3.3-1, item 24, but the LRA does not refer to LRA Table 3.3-1, item 24 for the raw water system. During the AMR audit, the team verified that the cooling water corrosion program will identify and manage any selective leaching that could occur in the raw water system.

g. Chemical and Volume Control System

During discussions with the applicant during the AMR audit, the audit team identified that the regenerative heat exchanger construction is not consistent with GALL, and that the GALL aging management could not be applied. For the regenerative heat exchanger, which is constructed of stainless steel and exposed to chemically treated borated water, LRA Table 2.3.3.1-1 cites link 3.3.1.08 for aging management of cracking due to SCC, consistent with the GALL. This link states that the aging management will consist of the chemistry program, with the effectiveness of the chemistry program verified by inspections performed using either the one-time inspection program, cooling water corrosion program, or periodic surveillance and preventative maintenance program. In discussions during the AMR audit, the applicant stated that the regenerative heat exchanger is welded such that the internals are not accessible. Due to the construction of the letdown heat exchanger, the applicant stated that the aging management of the regenerative heat exchanger would consist of the chemistry program with further evaluation of cracking due to stress corrosion cracking provided by inspection of welds using the inservice inspection program. The applicant considered this adequate aging management to support the pressure boundary function.

h. Spent Fuel Pool Cooling

GALL/SRP item 3.3.1-01 also addresses the heat exchangers in the spent fuel pool cooling system. During the AMR audit, the team confirmed that the applicant has elected to use the chemistry program and the cooling water corrosion program to manage the spent fuel pool cooling heat exchangers, as indicated by the LRA Table 2.3.3.2-1 link to item 3.3.1.08. The applicant clarified that the inspections of the heat exchanger that are performed under the cooling water corrosion program cover both the cooling water side and the spent fuel pool side of the heat exchanger.

i. Primary Sampling

The applicant's response to RAI 3.3-2 clarifies that deoxygenated treated water greater than 200 °F corresponds to secondary water. The staff notes that for nickel-base alloy in this environment, the applicant credits inspections under the cooling water corrosion program to verify the effectiveness of the chemistry program for a heat exchanger. However, the cooling water corrosion program is designed for the closed cooling system, which is the "other side" of the heat exchanger. During the on-site AMR audit, the staff verified that the applicant is performing inspections of the nickel-base alloy in secondary water as part of the cooling water corrosion program activities.

7. Steam and Power Conversion Systems

a. Auxiliary Feedwater

During the AMR audit, the team reviewed the auxiliary feedwater water sources and confirmed that auxiliary feedwater piping is not exposed to untreated water.

b. The audit team requested the applicant to confirm the following information in the LRA:

- i the materials and environments for bolting in the steam and power conversion systems;
- ii that the flow-accelerated corrosion program focuses on the most susceptible locations;
- iii that Aging Management Program B.2.7, "Periodic Surveillance and Preventive Maintenance Program," provides aging management of oil systems, equivalent to Generic Aging Lessons Learned Aging Management Program XI.M21, "Closed-Cycle Cooling Water," for cooling water.

In response, the applicant confirmed:

- i that the bolting materials and environments identified in the LRA are correct;
- ii that the flow accelerated corrosion program focuses on the most susceptible locations;
- iii that the one-time inspection, selective leaching, and periodic surveillance and preventive maintenance programs will provide aging management equivalent to the Generic Aging Lessons Learned Report requirements for the cooling water programs, as described in the response to RAI 3.4.1-10.

8. Structures

The audit team reviewed groundwater and river data to confirm that below-grade concrete is not exposed to an aggressive environment, including pH, chlorides, and sulfates. The data confirmed that below-grade exterior reinforced concrete is exposed to a non-aggressive environment with (pH<5.5, chlorides >500 ppm, and sulfates >1500 ppm). In addition, the team requested the applicant to confirm the following information:

- a. the periodic monitoring of below-grade water chemistry, including frequency;
- b. that there are no aging effects requiring management for the trisodium phosphate baskets;
- c. that operating experience supports the conclusion that Class A and B pipe piles below grade have no aging effects requiring management, and that below-grade soil and water would not cause loss of material.

In response, the applicant confirmed for the team:

- a. that the information provided in response to RAI 3.5.1-8 is correct and samples are collected every 5 years;
- b. that there are no plausible aging effects for the trisodium phosphate baskets;
- c. that Class A and B pipe piles below grade have no aging effects requiring management, and that below-grade soil and water won't cause loss of material.

9. Electrical

The audit team requested clarification whether fuse holders are within scope and subject to an AMR, and whether management of the fuse holders are in accordance with the fuse holder ISG. In response, the applicant provided its position on fuse holders relative to the ISG.

The team noted that the reviewer could not find how I&C cables were dispositioned in the response to RAI 2.5-1, and could not find the SBO boundary drawing. The applicant provided the RAI response and the boundary drawing.

10. Aging Management Programs

a. Bolting Integrity

The team requested that the applicant provide the ASME, Section XI edition and addenda year that was used for the IWF-2000 bolting inspection. The applicant stated that the FCS ISI Program Plan, Third Ten-Year Interval, 1993-2003 is compliant with the ASME XI, 1989 Edition (no addenda). Compliance for the next 10-year interval will be to the 1998 Edition through the 2000 Addenda.

The team also requested justification for the exception identified in the applicant's bolting integrity program. In response, the applicant stated that plant and industry operating experience showed no instances of bolt cracking.

b. Containment Inservice Inspection

The team requested that the applicant provide a list of approved relief requests and alternatives for performing IWE inspections in lieu of the requirements of the 1992 Edition and 1992 Addenda (or the 1995 Edition and 1996 Addenda) stipulated in GALL AMP XI.S1 (many licensees have requested relief from certain categories of IWE inspections, and have provided alternatives to comply with 10 CFR 50.55(a)). In response, the applicant provided a copy of Attachment 11 of EA-FC-00-092, "FCS Containment Inservice Inspection Program (Subsections IWE & IWL)," which included an approved relief request.

In addition, the team asked what acceptance criteria are used for examining containment concrete (element 6 of GALL AMP XI.S2 recognizes lack of explicit acceptance criteria for concrete components, and recommends Chapter 5 of ACI 349.3R). In response, the applicant stated that the containment ISI program

implements the acceptance criteria as identified in GALL in accordance with ASME Section XI, Subsection IWL, Article IWL-3000 and Articles IWL-2330/2510. The FCS structures monitoring program addresses proposed revisions to the containment inspection procedure to include acceptance criteria guidance identified in Chapter 5 of ACI 349.3R.

c. Fire Protection

The audit team requested the applicant to confirm the following information in the LRA:

- i that the scope of the fire protection program includes components identified in GALL AMPs XI.M26 and XI.M27;
- ii that the fire protection program addresses element 3 of GALL AMPs XI.M26 and XI.M27.

In response, the applicant confirmed for the team:

- i that the fire protection program scope includes the components identified in XI.M26 and XI.M27;
- ii that the fire protection program addresses all the guidance in program element 3, with the following clarifications:
 - A. Per the ISG on the aging management of fire protection systems for license renewal, the halon fire suppression system inspections and functional tests do not require valve line-up verifications or that the suppression agent charge pressure be monitored during the test. Although the suppression agent charge pressure is checked on a semi-annual basis and inspections are performed on a monthly basis that verify that the suppression agent supply valves are open and that the system is in automatic mode, these activities are not credited for license renewal.
 - B. Some inspections of the halon fire suppression system are not conducted on a six-month periodicity, as provided below:
 - 1. Visual and functional tests of the control room walk-in cabinet, cable spreading room, and switchgear room halon fire protection systems are conducted on an 18-month frequency.
 - 2. The fire protection system halon system air-flow test, which verifies each halon nozzle and associated piping is unobstructed, is conducted on a 3-year frequency.
 - 3. Fire dampers are inspected on an 18-month frequency. Operating experience at FCS has shown that these inspection frequencies are adequate to ensure the system maintains its intended function.

- C. As noted in the FCS LRA, Section B.2.5, periodic flow testing of infrequently used loops of the fire water system is conducted using a clean water source (either demineralized water or Blair City water) vice the fire protection system fire pumps. This results in slightly less than maximum design flow. However, both the pressure and resulting flow are sufficient to entrain and adequately flow test/flush the sprinkler system piping.

d. Containment Leak Rate Program

The team requested clarification on which of the 2 Type-C test options provided in GALL AMP XI.M54 (Appendix J testing or individual system testing) will be used by the applicant. The applicant stated that Appendix J will be used.

e. General Corrosion of External Surfaces

The team asked the applicant whether CCW components are within the scope of the general corrosion of external surfaces program. The applicant stated that they are. The team also asked whether insulated components are considered inaccessible. The applicant clarified that when insulation is removed for maintenance, the components are inspected.

f. Structures Monitoring

The team requested the applicant to identify where on-site implementing procedures identify and manage structural bolting. In response, the applicant provided on-site procedures SE-PM-AE-1001, 1002, 1003, and SE-ST-CONT-0001. The applicant committed to revising these procedures to more clearly define the components (including bolts) to be inspected.

g. One-Time Inspections

The audit team attempted to confirm whether the applicant will utilize volumetric inspections for small-bore piping, and whether the inspection locations will be based on accessibility, exposure levels, and NDE techniques. In addition, the team attempted to confirm that the locations will be consistent with Information Notice 97-46, "Unisolable Crack in High-Pressure Injection Piping," July 9, 1997. The team also attempted to confirm whether the applicant will identify locations based on highest susceptibility to stress corrosion cracking, thermal penetration, and thermal stratification.

During the audit, the applicant stated that the selection of locations and method of examination will be consistent with NUREG-1801, Section XI.M32, "One-Time Inspections."

The team reviewed Attachment 3 of EA-FC-00-088, "One-Time Inspection Program," which states that the applicant is committed to developing a program basis document to address these issues. The applicant is tracking this commitment through Action Request (AR) 29952. The audit team reviewed AR 29952, and found that the AR did

not specify that the small-bore piping locations will consider thermal penetration and thermal stratification.

The team also reviewed Attachment 6 of EA-FC-00-088. Small-bore piping is identified as being composed of stainless steel exposed to borated water, with cracking as the applicable aging effect. This line item identifies Justification 20, which states that an augmented inspection will be conducted and will require a volumetric examination, or equivalent, of the small-bore piping, which is currently not required by ASME Section XI ISI for nominal pipe size < 4 inches.

/RA/

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Office of Nuclear Reactor Regulation

Docket No.: 50-285

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